What is claimed is:

1. A voltage-controlled tunable multilayer filter comprising:

a first resonator on a first layer of dielectric material or low-temperature-co fired-ceramic;

a second resonator coupled to said first resonator on a second layer of dielectric material or low-temperature-co fired-ceramic;

a third resonator located on a third layer of dielectric material or low-temperature-co fired-ceramic coupled to said second resonator and cross coupled to said first resonator;

an input transmission line connected to said first resonator;

an output transmission line connected with said third resonator; and

a variable capacitor in at least one of said resonators.

2. The voltage-controlled tunable multilayer filter of claim 1, further comprising a dc blocking capacitor in at least one of said resonators.

3. The voltage-controlled tunable multilayer filter of claim 2, further comprising DC biasing circuit associated with said filter.

4. The voltage-controlled tunable multilayer filter of claim 3, wherein said DC biasing lines include at least one resister to prevent leakage into said DC biasing lines.

5. The voltage-controlled tunable multilayer filter of claim 1, wherein there are a total of nine layers of LTCC tape or dielectric material.

6. The voltage-controlled tunable multilayer filter of claim 5, wherein at least two of said nine layerers are used as the inner ground plane to implement the stripline structure.

7. The voltage-controlled tunable multilayer filter of claim 6, wherein layer 2 and layer 6 are used as the inner ground plane to implement the stripline structure.

8. The voltage-controlled tunable multilayer filter of claim 7, wherein the portion of each combline resonator between said layer 2 and layer 6 is in stripline form and the remainder of the resonators are on the top layer and in microstripline form.

9. The voltage-controlled tunable multilayer filter of claim 4, wherein said at least one resister in the biasing circuit is implemented in layer 1 with resistive paste.

10. The voltage-controlled tunable multilayer filter of claim 7, wherein the input output lines are taken to the bottom plane through the apertures in layer 2.

11. The tunable filter of claim 1, wherein said variable capacitor comprises:

a substrate having a low dielectric constant with planar surfaces;

a tunable dielectric film on said substrate comprising a low loss tunable dielectric material;

a metal electrode with predetermined length, width, and gap distance; and

a low loss isolation material used to isolate an outer bias metallic contact and a metallic electrode on the tunable dielectric.

12. The voltage-controlled tunable multilayer filter of claim 1, wherein the center frequency of the filter is tuned by changing the variable capacitor capacitance by changing the voltage.

13. A method of using voltage to tune a multilayer filter, comprising the steps of:

providing a first resonator on a first layer of dielectric material or low-temperature-co fired-ceramic;

providing a second resonator coupled to said first resonator on a second layer of dielectric material or low-temperature-co fired-ceramic;

providing a third resonator located on a third layer of dielectric material or low-temperature-co fired-ceramic coupled to said second resonator and cross coupled to said first resonator;

inputting a transmission line connected to said first resonator;

outputting a transmission line connected with said third resonator; and

varying the capacitance in at least one of said resonators.

14. The method of using voltage to tune a multilayer filter of claim 13, further comprising the steps of including a dc blocking capacitor in at least one of said resonators.

15. The method of using voltage to tune a multilayer filter of claim 14, further comprising biasing said filter with a DC biasing circuit.

16. The method of using voltage to tune a multilayer filter of claim 15, wherein said DC biasing lines include at least one resister to prevent leakage into said DC biasing lines.

17. The method of using voltage to tune a multilayer filter of claim 13, wherein there are a total of nine layers of LTCC tape or dielectric material.

18. The method of using voltage to tune a multilayer filter of claim 17, wherein at least two of said nine layerers are used as the inner ground plane to implement the stripline structure.

19. The method of using voltage to tune a multilayer filter of claim 18, wherein layer 2 and layer 6 are used as the inner ground plane to implement the stripline structure.

20. The method of using voltage to tune a multilayer filter of claim 19, wherein the portion of each combline resonator between said layer 2 and layer 6 is in stripline form and the remainder of the resonators are on the top layer and in microstripline form.

21. The method of using voltage to tune a multilayer filter of claim 16, wherein said at least one resister in the biasing circuit is implemented in layer 1 with resistive paste.

22. The method of using voltage to tune a multilayer filter of claim 19, wherein the input output lines are taken to the bottom plane through the apertures in layer 2.

23. The method of using voltage to tune a multilayer filter of claim 13, wherein said variable capacitor comprises:

a substrate having a low dielectric constant with planar surfaces;

a tunable dielectric film on said substrate comprising a low loss tunable dielectric material;

a metal electrode with predetermined length, width, and gap distance; and

a low loss isolation material used to isolate an outer bias metallic contact and a metallic electrode on the tunable dielectric.

24. The method of using voltage to tune a multilayer filter of claim 13, wherein the center frequency of the filter is tuned by changing the variable capacitor capacitance by changing the voltage.

25. A voltage-controlled tunable multilayer filter comprising:

a first resonator on a first layer of dielectric material or low-temperature-co fired-ceramic;

a second resonator coupled to said first resonator on a second layer of dielectric material or low-temperature-co fired-ceramic;

a third resonator located on a third layer of dielectric material or low-temperature-co fired-ceramic coupled to said second resonator and cross coupled to said first resonator;

an input transmission line connected to said first resonator;

an output transmission line connected with said third resonator; and

a MEMS based varactor in at least one of said resonators.

26. The voltage-controlled tunable multilayer filter of claim 25, wherein said MEMS varactor uses a parallel plate topology.

27. The voltage-controlled tunable multilayer filter of claim 25, wherein said MEMS varactor uses an interdigital topology.